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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Chen-Gum Oh

Serial No. : 10/493,251

Filed : April 15, 2004

For : The Acetylation Method of Chitosan

Group Art Unit : 1623

Examiner : Krishnan, Ganapathy

(Tel. : 571-272-0654, Fax. : 571-273-8300)

Date of Office Action : July 20, 2007

Dear Examiner Krishnan,

This is applicant of the above patent application.

Thanks received with your Final Office Action of July 20, 2007.

The present invention is not general acetylation method of chitosan, but the acetylation method of chitosan using an inline mixer, specially invented equipment. So, the range of the present invention is claimed by limitation extremely.

The present invention is not obvious over the prior art.

Please read my opinion as the below.

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## 1. About 35 U.S.C. 112

In Examples of the application specification,

Example 1: [0061] 100 kg of chitosan was uniformly dissolved in 2.000 kg of a 1.5% solution produced by dilution of acetic acid (98%) in water.

Example 2 : [0072] This example was carried out in the same manner as described in Example 1 except that a 2.5% solution produced by dilution of lactic acid (90%) in water

Example 3 : [0083] 2 kg of a 1% chitosan solution having a viscosity of 15 cps and a deacetylation degree of 85% was uniformly dissolved in 100 kg of a 1%(w/w) solution produced by dilution of lactic acid (90%) in water.

Example 4 : [0106] 100 kg of chitosan was uniformly dissolved in 1,000 kg of a 3.0% acetic acid solution produced by dilution of acetic acid (98%) in water.

The terms " in dilution of organic acids" means that it is produced solution by putting organic acids into water.

I will amend to be clear the term.

## 2. About 35 U.S.C. 103

The Acetylation Method of Chitosan has been known in the prior art.

But, the prior art have many problem such that the process conditions for mass production are not easy, or vast and time are required for industrial application, or disadvantageous the purity or acetylation degree.

So, Inventors of the present invention was sought the new method for conquest the

problems.

That is, the present invention is "The Acetylation Method of Chitosan using an inline mixer".

I will attach the photograph of inline mixer stated in Fig 2 of the specification.

As the shown in Fig 2 and attached the photograph of inline mixer, the inline mixer forms turbulent and whirl flow with the alternate forward screw blades and backward screw blades. The chitosan or chitosan oligosaccharide solution, alkali solution and acetic acid anhydride flow in the inline mixer simultaneously and pass through it. The materials are promptly mixed during flowing in the mixer and instantaneous acetylation occurs.

The present invention solves problems by use of the inline mixer that performs acetylation instantaneously in liquid state before the acetic acid anhydride changes to acetic acid, and simultaneous entry of alkali enables high acetylation product with smaller amount of acetic acid anhydride.

Accordingly, acetylation process is simplified, there is no need of solvent to stabilize acetic acid anhydride, mass production and adjusting acetylation are facilitated, the amount of acetic acid anhydride used in the process is substantially reduced, and manufacturing cost and time are substantially reduced.

That is, the present invention is not general acetylation method of chitosan, but the acetylation method of chitosan using an inline mixer, specially invented equipment.

So, the range of the present invention is claimed by limitation extremely.

Ordinary skill in the art at the time the invention can not production with easy the present invention from the combination.

Accordingly, Claim 1, 4, 7, and 10-12 of the present invention is different with the combination of the cited references.

So, Please grant the present invention after examination my amendment and response bring forward.

Thank you.

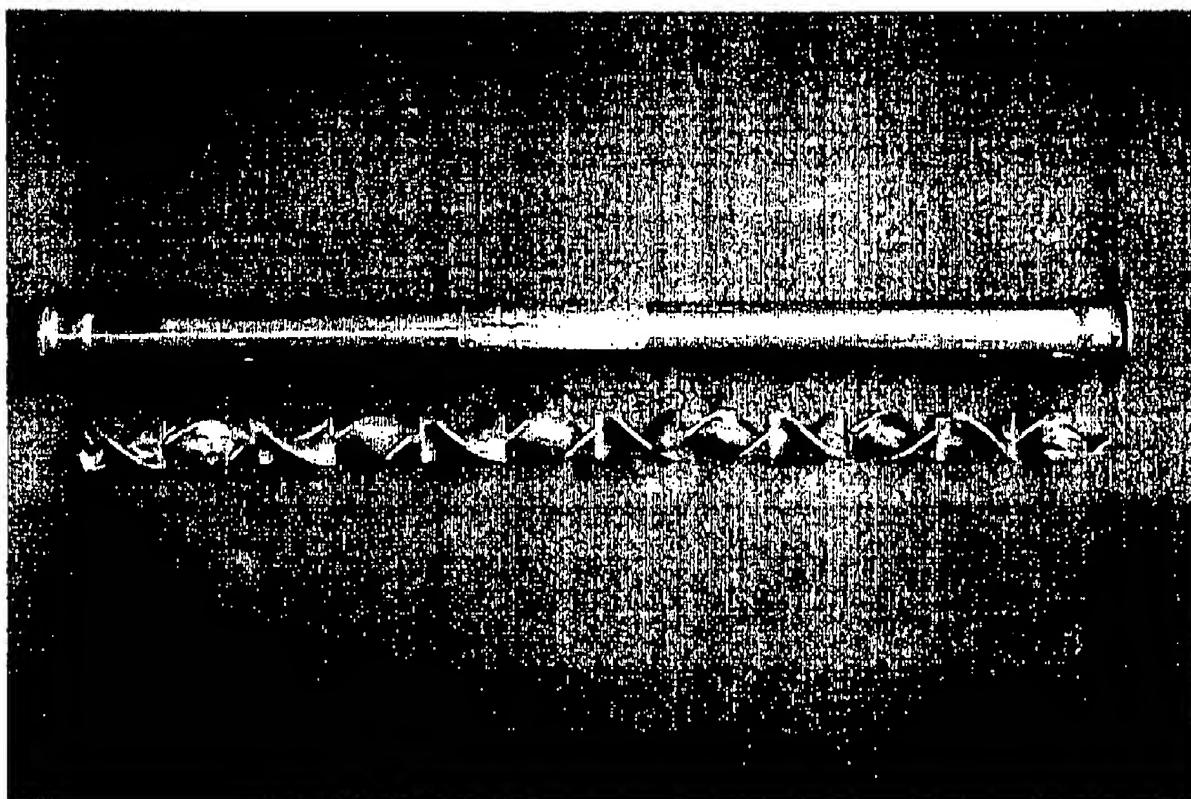
\* Attachment : Photograph of the Inline Mixer-----3pages.

Tel : 82-42-360-6648

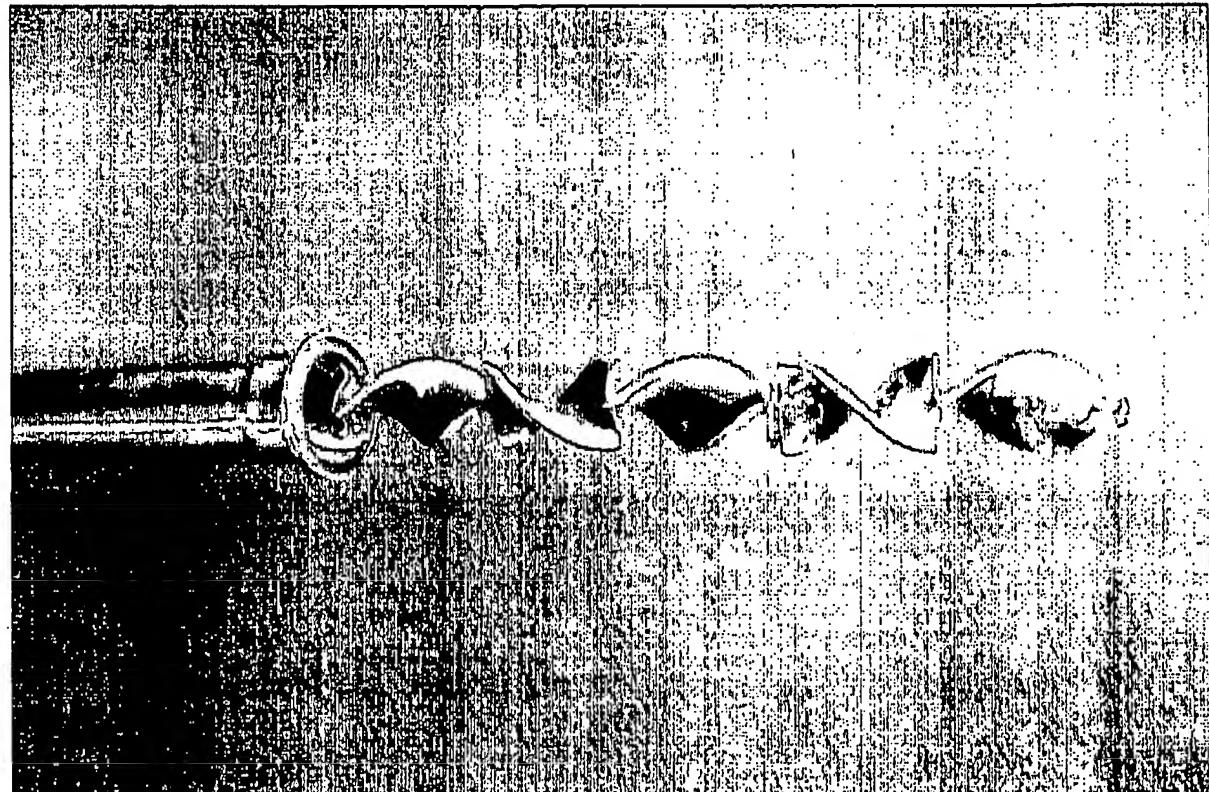
Fax : 82-42-360-6649

E-mail address : hijoon01@hanmail.net

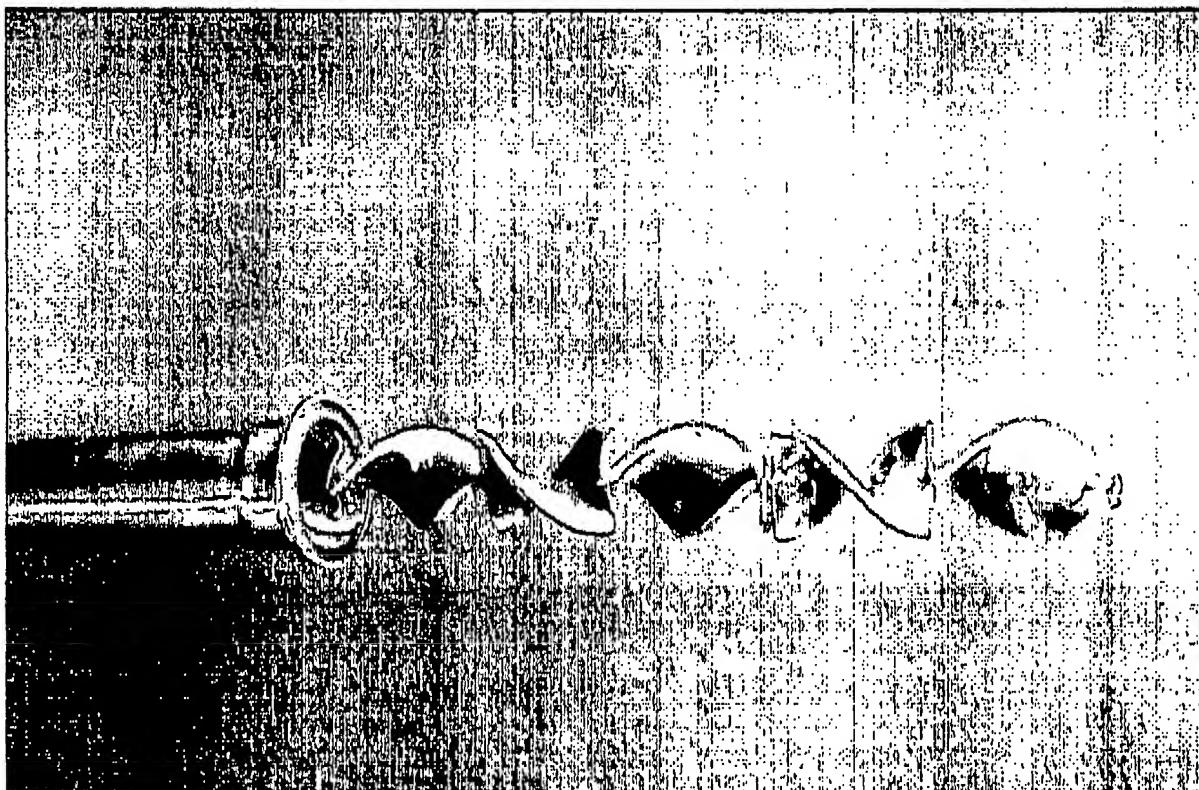
1. Appearance Photograph about Outward form and Internal screw of the Inline Mixer



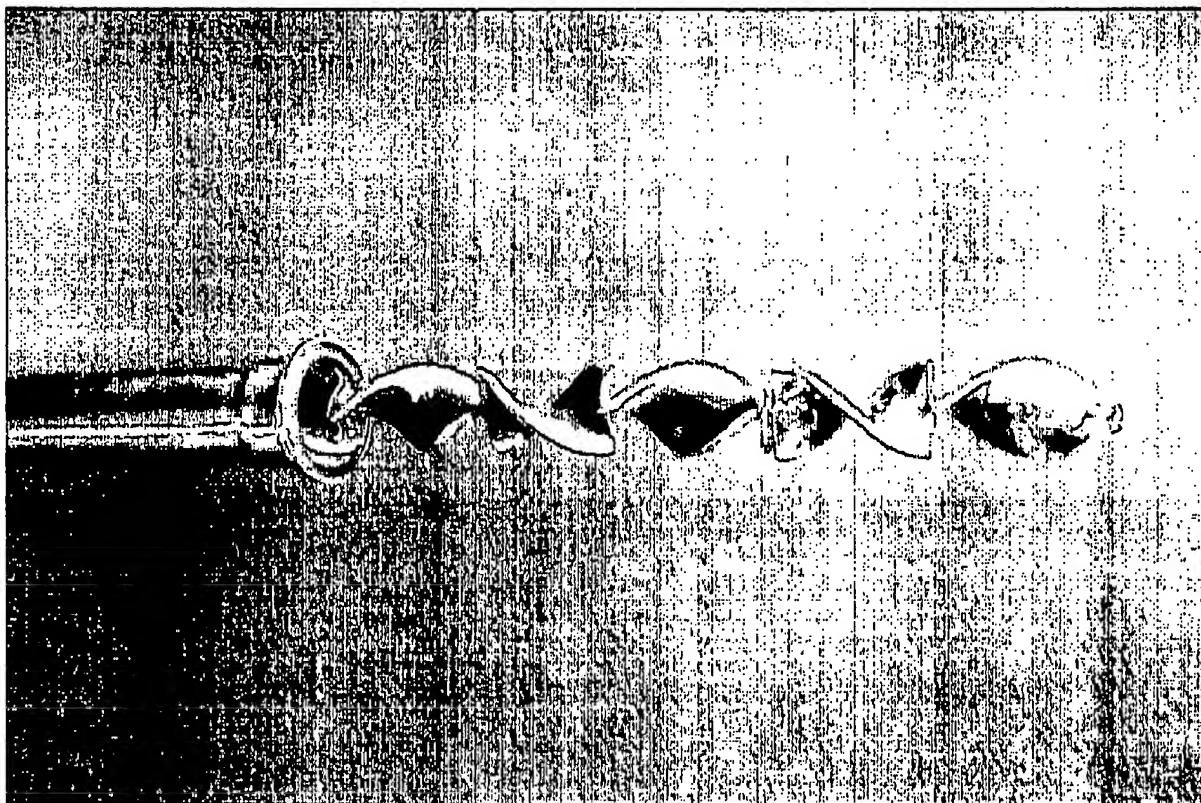
2. Combination Photograph 1 about Outward form and Internal screw of the Inline Mixer



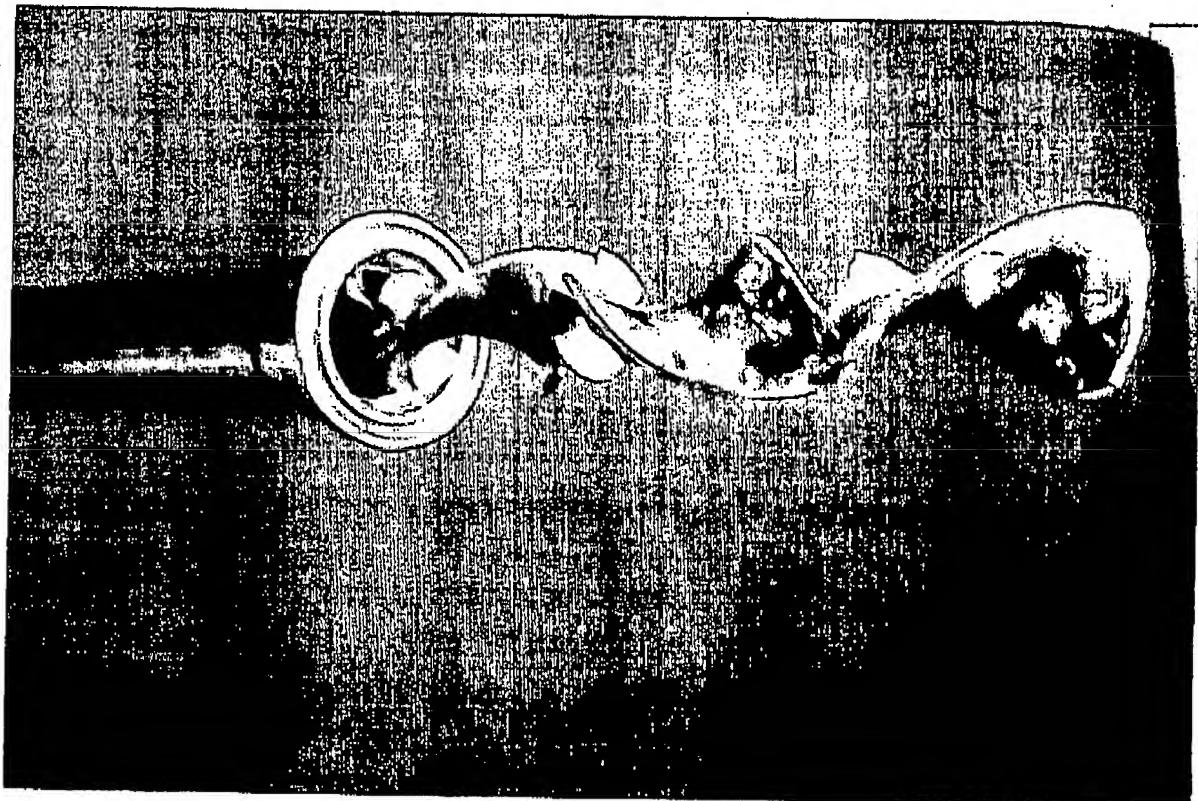
2. Combination Photograph 1 about Outward form and Internal screw of the Inline Mixer



2. Combination Photograph 1 about Outward form and Internal screw of the Inline Mixer



3. Combination Photograph 2 about Outward form and Internal screw of the Inline Mixer



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